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U.S. Support Program Topical Meetings 1999 to 2008

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Abstract
In 1999, the International Safeguards Project Office began organizing topical workshops to explore technical issues facing the International Atomic Energy Agency's Department of Safeguards. Representatives from IAEA member states including the United States, national laboratories and companies were invited to the workshops to discuss the technical issues. In some cases professional facilitators were hired to lead the discussions and in some cases business gaming techniques were employed. Since 1999, the following topics have been addressed: Data Communication Technologies (1999), Information Security (2000), Design and Testing for High Reliability (2001), Standardization and Integration of Unattended and Remote Monitoring Systems (2002), Roadmapping: Surveillance (2003), IAEA Seals Technology Roadmapping Workshop (2004), Turning Information Into Knowledge (2004), Safeguards Tools of the Future (2005), and Advanced Sensors for Safeguards (2007). This paper will review the scope of the workshops and summarize their results.

Introduction

The USSP organized the Workshop on International Data Communications in 1999, to assist the IAEA with the technical issue of how to transmit the vast amount of information generated by remote monitoring. This workshop was not requested by the IAEA, but the Subgroup on Safeguards Technical Support (SSTS) and the International Safeguards Project Office (ISPO) recognized that the IAEA could benefit from experts discussing this issue and offering their recommendations. ISPO invited representatives to participate from the IAEA, the SSTS, the U.S. public and private sectors, academia, and other Member State Support Programs (MSSPs). The meeting was successful in providing useful information to the IAEA.

As a result, the IAEA requested that the USSP sponsor and host a series of workshops over the last decade. Each workshop was held to address a specific technical need of the IAEA and usually resulted in a set of recommendations for the IAEA to consider. This paper summarizes the objectives and results of each workshop and the USSP activities which were funded following each workshop.

Workshop on International Data Communications (October 18-20, 1999)

The intent of this Workshop was to bring the IAEA Department of Safeguards together with communications experts from industry to discuss the IAEA's requirements for the transmission of data resulting from remote monitoring activities. The exchange of information, experiences, and opinions would assist the IAEA in meeting its present and future challenges in establishing and maintaining effective global data communication ability. The Workshop was held for two and a

half days and was facilitated by Massimo Aparo, the Section Head for Equipment Development and Support, Division of Technical Support (SGTS), at that time.

The participants identified obstacles to implementing remote monitoring, which included funding uncertainty, requirements for authentication and encryption, lack of local communications infrastructure, and rapid developments in technology. The need for remote monitoring was affirmed because of the volume of data to be collected and because the safeguards burden on member states is reduced. At the time this workshop was held, the IAEA had experience with a large number of remote monitoring stations using telephone and frame relays, and they were considering satellite communications and virtual private networks. The IAEA assumed that remote monitoring was cost effective, but they did not yet have the data necessary to justify remote monitoring on a cost effectiveness basis.

As a result of this workshop, the USSP provided funding over the past six years for two cost free experts (CFEs) to assist the IAEA with the implementation of remote monitoring. These experts will complete their assignments in 2008. The USSP has also sponsored vulnerability assessments of remote monitoring communications technologies. The Remote Monitoring Unit was established in SGTS during the 2007 reorganization of the Department of Safeguards' support divisions. The USSP approved a new CFE position to assist the new unit in 2008. [1]

International Workshop on Information Security (October 25-27, 2000)
ISPO was assisted in the organization of the International Workshop on Information Security by Lawrence Livermore National Laboratory. The workshop was held to help the IAEA address the challenges associated with the large amount of new information associated with the open source and remote monitoring programs. The member states entrusted the IAEA with additional information under the strengthened safeguards regime, but there is a delicate balance between allowing access to information for Agency staff who use it to draw safeguards conclusions, and securing the data from parties who might misuse it. Agency representatives also expressed concern about having sufficient funding to implement the necessary security measures, at the opening of the workshop.

The Workshop was organized in four sessions: "Current Status and Trends," in which the IAEA participants provided background information about the IAEA's network and security activities, "Planning and Implementing an Information Security Program," in which speakers delivered presentations on elements of information security programs, "Technology Opportunities," in which experts discussed issues of information security and methods, products, and new technologies, and the "Closing Plenary and Roundtable," in which a speaker from the Gartner Group talked about the steps required for an effective security program.

The USSP approved an umbrella task, Task D.127, "Improve the Security of Safeguards Network and Communication Information," prior to the workshop. The USSP continued to support activities under this task until 2005 and contributed over $1 million to study and to implement measures to improve the IAEA's information security. Activities included the production of a video by High Road Productions entitled: "Everyone Counts," which highlighted the importance of protecting

IAEA information, implementing key management for authentication, a pilot test of a biometric security system, and upgrading the Department of Safeguards' firewall. [2]

International Safeguards Workshop: Design and Testing for High Reliability (October 15-17, 2001)

The International Safeguards Workshop on Design and Testing for High Reliability was organized to address issues related to poor performance in remote and unattended monitoring systems, especially with surveillance. The IAEA needed practical and economical guidance for designing, procuring, and testing of systems, and for measuring properties of facility environments that can affect the performance of instrumentation. At the time of this workshop, the IAEA was facing surveillance failures caused by single event upsets (SEUs) due to exposure of the electronics to radiation.

In the discussions, IAEA management favored the use of simple robust instruments to ensure reliability and control costs, while the technical staff welcomed the capabilities offered by new complex instruments, despite their greater costs and support requirements. It was acknowledged by the participants that the IAEA would continue to rely on both instrumentation to complement the inspectors' time in facilities and on support from the MSSPs to provide equipment. The use of commercial, off-the-shelf (COTS) equipment and well-tested technology was discussed. The need for planning and quality management was cited. The SEU issue had been resolved, prior to the meeting, due to a collaborative effort by the U.S. and German Support Programs, but the IAEA recognized that in the future it would be necessary to better characterize the operating environment before development and to address it in the specifications.

The specific issues associated with surveillance equipment that prompted this workshop were diagnosed prior to the meeting, but they were investigated and resolved over a period of five years, at a cost of over $1 million. The USSP adopted a more structured approach to equipment development projects, to avoid such a situation in the future. The USSP has provided the services of a project manager in several cases, to assist the IAEA with management of complex system development. The USSP also insists on approved specifications being developed before a task is funded or as the first funded activity. The USSP has favored the use of COTS equipment, where appropriate, and has stressed the need for quality assurance in all areas of the Department of Safeguards activities. Quality Assurance or Quality Management has been among the USSP priorities, since the workshop. The USSP has maintained its support of the IAEA's Quality Management System through Task B.90, "Workshop on Quality Assurance Techniques." The Department of Safeguards' Quality Management System is now being considered for adoption by throughout the IAEA. [3]

Workshop on Standardization and Integration of Unattended and Remote Monitoring Systems (October 15-17, 2002)

The Workshop on Standardization and Integration of Unattended and Remote Monitoring Systems was held to resolve long-term issues about the efficacy of the IAEA's safeguards and surveillance systems. The IAEA hoped that the workshop would result in recommendations regarding

miniaturization of equipment, life-cycle studies, and the use of COTS products to help developers and to lower the costs of project management, training, procurement, and inventories.

The Workshop produced a number of conclusions:

1. Ethernet with TCP/IP protocol was considered the best way to communicate and to connect the data generators and the collect computer.
2. The IAEA was considering migrating from Windows NT to embedded Windows XP, but they committed to examining other topologies based on a central data collect computer with a mainstream operating system.
3. Defining a single standard for encryption and authentication that is appropriate for small battery powered instruments as well as review stations was a priority.
4. Standardizing state-of-health messages for IAEA instrumentation was important so that the IAEA could interpret a large amount of data from many instruments efficiently.
5. It was likely that virtual private networks (VPNs) would become the standard for remote monitoring data transmission.
6. Critical components for IAEA instruments and equipment had already been procured to guard against expected unavailability.

Following this workshop, the USSP funded a detailed study of operating systems for the IAEA's use in determining which operating system to use as its standard. This study was completed in 2004 and resulted in the selection of Windows XP. VPNs have become widely used for remote monitoring data transmission. Other means of communication are used when VPNs are not available or impractical. The USSP supports the stockpiling of critical components for IAEA Safeguards equipment, to extend the lifetime of the equipment past its commercial availability.

Standardization of equipment is difficult for the IAEA due to numerous suppliers, incompatible requirements, and competing interests. The IAEA reported during the 2008 MSSP Coordinators' Meeting that it maintains over one hundred types of nondestructive analysis instruments. The USSP will continue to stress the importance of standardization as a means to reduce the IAEA's workload and costs, despite the challenges. [4]

Roadmapping: Surveillance (September 29 - October 3, 2003)

The IAEA began planning in 2002 for the eventual replacement of the DCM-14-based surveillance systems. The DCM-14-based systems were approved for use in 1998. They had an expected ten-year lifetime, which indicated a need for a replacement by 2008. Roadmapping for Surveillance was held as a forum for expert review of the user requirements and design specification of the new surveillance system. The IAEA prepared draft documents to be used as working papers for the workshop. The USSP invited U.S. and international surveillance experts to participate. Over forty participants worked together to review and debate the IAEA's requirements and specifications. The document was modified in real time. The participants were given the opportunity to review the final draft, following the workshop.

The IAEA used the specifications which were finalized following the workshop as part of the request for proposals from contractors to develop the Next Generation Surveillance System

(NGSS). The NGSS is currently under development by Canberra Albuquerque and Dr. Neumann Consultants. It is funded by the U.S. and German Support Programs with a total USSP contribution of almost $3 million. Phase IV of the project (manufacturing the prototypes and testing) is scheduled to begin in September 2008. When it was foreseen that the NGSS would not meet the 2008 replacement schedule, the USSP assisted the IAEA with an interim upgrade that would extend the lifetime of the DCM-14-based systems. The NGSS is scheduled for implementation in 2010.

The value of this workshop is yet to be realized in the implementation of the NGSS, but the progress made during the development has shown the planning process to be very effective. The NGSS task has implemented many of the recommendations of the International Safeguards Workshop on Design and Testing for High Reliability, including strong project management and preparation of detailed user requirements and specifications.

Coordinated Technical Meeting on Future Sealing and Containment Verification Techniques and Methods (January 19-23, 2004)

The IAEA organized and hosted the Coordinated Technical Meeting on Future Sealing and Containment Verification Techniques and Methods, but it is addressed in this paper because the USSP funded a consultant to develop the meeting agenda and to facilitate the meeting. The IAEA convened this meeting to evaluate emerging technologies for sealing and containment verification and to obtain input for a long term development plan. This workshop was the first USSP workshop to use a "gaming" format to elicit expert feedback on technologies for safeguards.

While the meeting participants identified numerous technologies for the IAEA to consider, the list was shortened to ten short-term technologies, four medium-term technologies, and two long-term technologies for future study. The participants made the following recommendations to the IAEA:

1. The IAEA should track technologies in the public and private sectors.
2. The IAEA should conduct at least one feasibility study per year.
3. The IAEA should document its seals requirements and communicate them to technology providers.
4. The IAEA should continue to conduct reviews, such as this meeting, to explore issues related to sealing and containment verification technologies.
5. The IAEA should use operational experience to guide procurement.

The IAEA developed a research and development (R&D) strategy for seals, based on this meeting. The USSP received numerous requests for support related to seals improvements and has committed, to date, more than $2 million to tasks related to upgrading seals, vulnerability assessments, and evaluation and/or development of new technologies. [5]

Workshop on Turning Information into Knowledge (October 4-8, 2004)

The Division of Safeguards Information Technology (SGIT) Workshop on Turning Information into Knowledge was the first workshop requested by SGIT, now the Division of Safeguards Information Management (SGIM). It was convened to evaluate existing and emerging technologies which could be used by Safeguards information analysts. This workshop also used gaming to elicit ideas from

the participants. Two scenarios were developed to provide a framework for structuring debates on the different approaches available to the IAEA for addressing technology needs.

Short-term recommendations included the preparation of a technology strategy to guide the strengthening of the information infrastructure, software, and processes. It was suggested that an external technology review group be established to help SGIT identify new tools. The experts also recommended several specific tools which the IAEA could implement in the short-term. The experts encouraged the IAEA to continue to search for new tools for the long-term. The experts recommended the development of an information architecture which facilitates interoperability, the investigation of document summarization software, and a document management system.

The IAEA convened a meeting of experts, within a year of the workshop, to address the recommendations of the meeting. Several tools recommended during the workshop have been implemented by the IAEA. The concept for the IAEA's N-Vision project emerged as a result of this workshop. A U.S. CFE who attended this meeting became responsible for N-Vision. A second CFE to support N-Vision began her assignment in early 2008. [6]

Workshop on Safeguards Tools of the Future (October 10-14, 2005)
The Workshop on Safeguards Tools of the Future was a collaboration between SGTS and SGIT to produce a roadmap to identify and develop new technologies to support inspectors in the field. This workshop also used the gaming format to elicit expert feedback on technologies for safeguards. Two scenario-based exercises were developed to inspire ideas for solving the future IAEA safeguards needs. One scenario was based on complementary access inspection activities in the field. The other addressed complementary access activities at Headquarters.

The participants identified capabilities which they thought inspectors would need in the future. One of the well-supported recommendations of the workshop was the need for a Headquarters-based operations center. This would provide inspectors with a common picture of safeguards activities worldwide, and a single point of access to IAEA managers and subject matter experts to support inspection or maintenance activities. Numerous recommendations were categorized in the workshop report as communications, data processing, security, sensors and surveillance, and non-technology related issues. [7]

Experts Meeting on Sealing and Containment Verification Techniques and Methods (February 12-16, 2007)
The IAEA organized and hosted the Coordinated Technical Meeting on Future Sealing and Containment Verification Techniques and Methods, but it is addressed in this paper because the USSP funded a consultant to develop the meeting agenda and to facilitate the meeting. This workshop was held to update the R&D strategy and to assess emerging technologies relevant to the IAEA's work in upgrading the sealing systems and containment verification methods. The participants reviewed the IAEA's progress since the 2004 Coordinated Technical Meeting on Future Sealing and Containment Verification Techniques and Methods.

The workshop participants agreed that the IAEA's R&D strategy developed in 2004 was still valid. "Technology surprise" and its positive and negative aspects were discussed relative to their impact on SGTS. The participants made the following recommendations:

1. SGTS should develop containment verification user requirements and communicate them to the technical community.
2. The IAEA should request that MSSPs identify public and private sector technology providers and communicate the IAEA needs to them.
3. SGTS should establish a knowledge management database for managing their user requirements.
4. SGTS should update its technology roadmap for sealing and containment verification based on the results of this meeting.
5. The IAEA should improve communications with MSSPs and the technical community to facilitate the exchange of information.

The USSP will continue to support the IAEA's work in modernizing its sealing and verification capability. ISPO works closely with the Seals Unit in SGTS to understand their priorities and to manage their requests for technical support. [8]

International Safeguards Workshop for Sensors for Advanced Safeguards (April 23-27, 2007)
The primary objective of the Workshop on Sensors for Advanced Safeguards was to identify new and innovative sensor technologies capable of improving the detection of radioactive materials, effluents, and undeclared activities. This workshop is considered to be Part 2 of the Workshop on Safeguards Tools for the Future. The IAEA wanted to include sensors as part of the scope of the Safeguards Tools for the Future but it was thought, during planning, that there would not be sufficient time to address all topics adequately.

Participants contributed twenty technical presentations; each addressed one or more technologies. This workshop used scenarios to elicit ideas from the participants. One scenario addressed the ability of the IAEA to detect or verify highly enriched uranium at an enrichment site. A second addressed the IAEA's ability to detect unreported plutonium production at a research reactor. Ultra-low-field nuclear magnetic resonance was considered to be one technology that the IAEA should investigate for measuring the flow of uranium hexafluoride. The IAEA is considering the results of this workshop under its Novel Technologies Project.

The IAEA and the USSP have had informal discussions about conducting a third workshop to consolidate the results of the Workshop on Safeguards Tools of the Future and the International Safeguards Workshop for Sensors for Advanced Safeguards, and to develop a roadmap for future technology R&D. [9]

Technical Workshop on Facility Design and Plant Operation Features that Facilitate the Implementation of IAEA Safeguards (October 28-31, 2008)
The USSP has provided funding to support a workshop on the facilitation of safeguards in facility design. Several U.S. experts will attend. "Safeguards by Design" will help the IAEA control the costs of safeguards implementation, by encouraging the design of safeguards-friendly features into

nuclear facilities. This workshop is a first step in a multi-year MSSP task to identify the design features which are most important to support safeguards implementation. USSP funding will be used for workshop development, workshop facilitation, and preparation of the workshop report.

Summary

The USSP has contributed to eleven workshops since 1999, by hosting the workshop, by providing workshop facilitation, or by supporting agenda development. In all cases, the workshop resulted in numerous expert recommendations for the IAEA to consider. In four cases, the workshop resulted in significant USSP financial contributions for strengthening IAEA safeguards. Other workshops have resulted in advancement of IAEA programmatic concepts. The USSP believes that topical workshops are a good mechanism for addressing IAEA technical issues with a broad group of experts from international safeguards and other industries.

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